

**Wind Energy Industry Acknowledgement**  
**of**  
**Adverse Health Effects**

**Part 2 Detailed Analysis**

**An Analysis of the American/Canadian Wind Energy Association  
sponsored  
“Wind Turbine Sound and  
Health Effects  
An Expert Panel Review, December 2009”**

**Prepared by  
The Society for Wind Vigilance**

**[www.windvigilance.com](http://www.windvigilance.com)**

**January 2010**



A/CanWEA Panel Review Page Reference	<p align="center"><b>Table 1 Analysis</b></p> <p align="center">A/CanWEA Panel Review contents in non bold quotations  <i>The Society for Wind Vigilance analysis in bold italicized</i></p>
<p align="center"><b>Notice to Reader</b></p> <p align="center"><b>The analysis contained in this table is not intended be exhaustive and does not address all the inadequacies contained in the A/CanWEA Panel Review.</b></p>	
Title Page	<p>"Prepared for: American Wind Energy Association and Canadian Wind Energy Association"</p> <p><i>Industry trade associations convening and sponsoring a literature review cannot be considered independent or unbiased.</i></p> <p><i>This approach is reminiscent of the now discredited "Tobacco Industry Research Committee" created in the 1950's and sponsored by the tobacco industry.</i></p> <p><u><a href="http://www.sourcewatch.org/index.php?title=Tobacco_Industry_Research_Committee">http://www.sourcewatch.org/index.php?title=Tobacco_Industry_Research_Committee</a></u></p>
ES1	<p>"Wind energy enjoys considerable public support, but it also has its detractors, who have publicized their concerns that the sounds emitted from wind turbines cause adverse health consequences."</p> <p><i>The A/CanWEA Panel Review uses biased pre-emptive stereotyping by labelling individuals or groups who have concerns about the adverse effects from exposure to industrial wind turbines as "detractors". The pre-emptive stereotyping attempts to invalidate legitimate concerns at the onset.</i></p> <p><i>Detractor is defined as "somebody who disparages or devalues somebody or something".</i></p> <p align="center"><i>Encarta® World English Dictionary [North American Edition] © &amp; (P)2009</i></p> <p><i>This pre-emptive stereotyping extends to concerned medical professionals such as members of the Maine Medical Association who have passed a resolution calling for independent research and the development of authoritative wind turbine guidelines designed to protect human health.</i></p> <p><i>This pre-emptive stereotyping dismisses the claim that the panel is independent and unbiased.</i></p>



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ES1	<p>“Following review, analysis, and discussion of current knowledge, the panel reached consensus on the following conclusions:</p> <ul style="list-style-type: none"> <li>• There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.</li> <li>• The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.</li> <li>• The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel’s experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.”</li> </ul> <p><b><i>The contents of the A/CanWEA Panel Review do not support these statements. See discussion on pages 5-1 and 5-2.</i></b></p>
2-1	<p>Methodology</p> <p>2.1 Formation of Expert Panel</p> <p>“The American and Canadian wind energy associations, AWEA and CanWEA, assembled a distinguished panel of independent experts to address concerns that the sounds emitted from wind turbines cause adverse health consequences.”</p> <p><b><i>Industry trade associations convening and sponsoring a literature review cannot be considered independent or unbiased.</i></b></p> <p><b><i>This approach is reminiscent of the now discredited “Tobacco Industry Research Committee” created in the 1950’s and sponsored by the tobacco industry.</i></b></p> <p><u><a href="http://www.sourcewatch.org/index.php?title=Tobacco_Industry_Research_Committee">http://www.sourcewatch.org/index.php?title=Tobacco_Industry_Research_Committee</a></u></p>
2-1	<p>2.2 Review of Literature Directly Related to Wind Turbines</p> <p>“The panel conducted a search of Pub Med under the heading “Wind Turbines and Health Effects” to research and address peer-reviewed literature. In addition, the panel conducted a search on “vibroacoustic disease.” The reference section identifies the peer and non-peer reviewed sources that were consulted by the panel.”</p> <p><b><i>The search criteria used in the report is very limited and limiting.</i></b></p> <p><b><i>For example, additional searches should have included relevant headings such “wind turbines and adverse health effects”, “noise”,</i></b></p>



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	<p><b>"annoyance", "low frequency noise", "stress", "sleep disturbance" and "flicker" to name a few obvious omissions.</b></p> <p><b>The A/CanWEA Panel Review is not comprehensive as it did not consider other environmental exposures associated with wind turbine operations such as safety, visual acceptability, electromagnetic pollution and visual interference or flicker.</b></p> <p><b>The A/CanWEA Panel Review is an incomplete literature review.</b></p>
2-2	<p><b>"The reference section identifies the peer and non-peer reviewed sources that were consulted by the panel."</b></p> <p><b>The A/CanWEA Panel Review presents peer and non peer reviewed sources but displays selective bias regarding sources which do not support the conclusions of the report.</b></p> <p><b>Many relevant and authoritative sources have not been cited or discussed in the A/CanWEA Panel Review.</b></p> <p><b>See discussion regarding page 6-1.</b></p>
2-1	<p><b>2.3 Review of Potential Environmental Exposures</b></p> <p><b>"The panel conducted a review of potential environmental exposures associated with wind turbine operations, with a focus on low frequency sound, infrasound, and vibration."</b></p> <p><b>The A/CanWEA Panel Review was not comprehensive as it ignored other environmental exposures associated with wind turbine operations such safety, visual acceptability, electromagnetic pollution and visual interference or flicker.</b></p> <p><b>In summary the A/CanWEA Panel Review is an incomplete literature review.</b></p>
3-12 to 3-14	<p><b>3.3 Potential Adverse Effects of Exposure to Sound</b></p> <p><b>The A/CanWEA Panel Review displays selective bias in citing noise limits from various references regarding potential adverse effects of exposure to sound (sections 3.3.1-3.3.5).</b></p> <p><b>The A/CanWEA Panel Review cites selective noise limits which are consistently higher than the authoritative health based noise guidelines of the World Health Organization.</b></p> <p><b>3.3.1 Speech Interference</b></p>



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	<p>"Levels below 45 dBA can be considered irrelevant with respect to speech interference."</p> <p><i>The A/CanWEA Panel Review displays selective bias by citing a level of 45dBA.</i></p> <p><i>World Health Organization guidelines indicates a level of 35 LAeq[dB] to protect speech intelligibility and moderate annoyance, daytime and evening (Guidelines For Community Noise 1999)</i></p> <p><i>(Note this reference is listed in the References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><i>Note: an increase of 10 dBA is a 10-fold increase in acoustic energy.</i></p> <p>3.3.2 Noise-Induced Hearing Loss "Regulatory (OSHA, 1983) and advisory (NIOSH, 1998) authorities in the U.S. concur that risk of NIHL begins at about 85 dBA"</p> <p><i>The A/CanWEA Panel Review displays selective bias by citing a level of 85dBA.</i></p> <p><i>World Health Organization guidelines recommend a level of 70 LAeq [dB] to protect against hearing impairment in industrial, commercial, shopping and traffic areas, indoors and outdoors (Guidelines For Community Noise 1999)</i></p> <p><i>(Note this reference is listed in the References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><i>Note an increase of 10 dBA is a 10-fold increase in acoustic energy.</i></p> <p>3.3.3 Task Interference</p> <p>"Levels below 70 dBA do not result in task interference."</p> <p><i>The A/CanWEA Panel Review displays selective bias by citing a level of 70dBA.</i></p> <p><i>World Health Organization guidelines recommend a level of 35 LAeq [dB] to protect disturbance of information extraction (e.g. comprehension and reading acquisition). (Guidelines For</i></p>



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	<p><b>Community Noise 1999)</b></p> <p align="center"><i>(Note this reference is listed in the References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><b>Note an increase of 10 dBA is a 10-fold increase in acoustic energy.</b></p> <p>3.3.4 Annoyance</p> <p>"It is important to note that although annoyance may be a frustrating experience for people, it is not considered an adverse health effect or disease of any kind."</p> <p><b>The A/CanWEA Panel Review displays selective bias by ignoring the adverse health effect of noise induced annoyance.</b></p> <p><b>Health Canada states in their publication "It's Your Health":</b></p> <p align="center"><i>"The most common effect of community noise is annoyance, which is considered an adverse health effect by the World Health Organization."</i></p> <p align="center"><u><a href="http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/community-urban-eng.php#he">http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/community-urban-eng.php#he</a></u></p> <p><b>World Health Organization states:</b></p> <p align="center"><i>"The range of health effects of noise is wide. They include pain and hearing fatigue, hearing impairment including tinnitus, annoyance..."</i></p> <p align="center"><u><a href="http://www.euro.who.int/Noise/activities/20021203_2">http://www.euro.who.int/Noise/activities/20021203_2</a></u></p> <p align="center"><i>"Sleep disturbance and annoyance are the first effects of night noise and can lead to mental disorders.</i></p> <p align="center"><i>The effects of noise can even trigger premature illness and death."</i></p> <p align="center"><u><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008_1">http://www.euro.who.int/mediacentre/PR/2009/20091008_1</a></u></p> <p><b>W. David Colby, M.D., one of the authors of the A/CanWEA Panel Review, described the consequence of wind turbines induced annoyance when he publicly stated:</b></p>



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	<p><b><i>"We're not denying that there are people annoyed and that maybe some of them are getting stressed out enough about being annoyed that they're getting sick."</i></b></p> <p><b><i>W. David Colby, M.D, Sounding Board, 97.9 FM The Beach December 17, 2009</i></b></p> <p><b><i>The A/CanWEA Panel Review ignores the serious risk to human health that annoyance and stress may cause.</i></b></p> <p><b><i>According to Health Canada:</i></b></p> <p><b><i>"...stress is considered to be a risk factor in a great many diseases, including:</i></b></p> <ul style="list-style-type: none"> <li><b><i>• heart disease</i></b></li> <li><b><i>• some types of bowel disease</i></b></li> <li><b><i>• herpes</i></b></li> <li><b><i>• mental illness</i></b></li> </ul> <p><b><i>Stress also makes it hard for people with diabetes to control their blood sugar.</i></b></p> <p><b><i>Stress is also a risk factor in alcohol and substance abuse, as well as weight loss and gain. Stress has even been identified as a possible risk factor in Alzheimer's Disease. Severe stress can cause biochemical changes in the body, affecting the immune system, leaving your body vulnerable to disease."</i></b></p> <p><b><i><a href="http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/stress-eng.php">http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/stress-eng.php</a></i></b></p> <p><b><i>"Noise from airports, road traffic, and other sources (including wind turbines) may annoy some people, and, as described in Section 4.1, the louder the noise, the more people may become annoyed."</i></b></p> <p><b><i>The A/CanWEA Panel Review ignores the risk to human health from "Noise from airports, road traffic, and other sources (including wind turbines)".</i></b></p> <p><b><i>World Health Organization states:</i></b></p> <p><b><i>"The effects of noise can even trigger premature illness and death. Night noise from aircraft can increase blood pressure, even if it does not wake people. Noise is likely to be more harmful when people are trying to fall asleep and awaken. Recent studies show that aircraft noise in the early morning is the most harmful in increasing the heart rate."</i></b></p>



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	<p align="center"><b><i>"Nuisance at night can lead to an increase in medical visits and spending on sleeping pills, which affects families' budgets and countries' health expenditure."</i></b></p> <p align="center"><u><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008_1">http://www.euro.who.int/mediacentre/PR/2009/20091008_1</a></u></p> <p>3.3.5 Sleep Disturbance</p> <p>"DNL is a 24-hour average that gives 10 dB extra weight to sounds occurring between 10p.m. and 7 a.m., on the assumption that during these sleep hours, levels above 35 dBA indoors may be disruptive."</p> <p><b><i>While the A/CanWEA Panel Review acknowledges "... levels above 35 dBA indoors may be disruptive" it cites a 1974 document without citing WHO (1999).</i></b></p> <p><b><i>World Health Organization guidelines recommend a level of 30 LAeq [dB] indoors to protect against sleep disturbance and when the noise is composed of a large proportion of low-frequency sounds a still lower guideline value is recommended, because low frequency noise (e.g. from ventilation systems) can disturb rest and sleep even at low sound pressure levels. (Guidelines For Community Noise 1999)</i></b></p> <p align="center"><b><i>(Note this reference is listed in the References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b><i>Note an increase of 10 dBA is a 10-fold increase in acoustic energy.</i></b></p> <p><b><i>World Health Organization "Night Noise Guidelines for Europe" 2009 states:</i></b></p> <p align="center"><b><i>"For the primary prevention of subclinical adverse health effects related to night noise in the population, it is recommended that the population should not be exposed to night noise levels greater than 40 dB of Lnight, outside during the part of the night when most people are in bed. The LOAEL of night noise, 40 dB Lnight, outside, can be considered a health-based limit value of the night noise guidelines (NNG) necessary to protect the public, including most of the vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise."</i></b></p>



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	<p><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><b>The A/CanWEA Panel Review ignores the serious adverse health consequences from noise induced sleep disturbance.</b></p> <p><b>World Health Organization states:</b></p> <p><b><i>"Recent research clearly links exposure to night noise with harm to health. Noise can aggravate serious health problems, beyond damage to hearing, particularly through its effects on sleep and the relations between sleep and health."</i></b></p> <p><b><i><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008_1">http://www.euro.who.int/mediacentre/PR/2009/20091008_1</a></i></b></p> <p><b>World Health Organization "Night Noise Guidelines for Europe" 2009 states:</b></p> <p><b><i>"There is plenty of evidence that sleep is a biological necessity, and disturbed sleep is associated with a number of health problems. Studies of sleep disturbance in children and in shift workers clearly show the adverse effects."</i></b></p> <p><b><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b>According to World Health Organization some of the documented health related consequences of sleep debt include poor performance at work, fatigue, memory difficulties, concentration problems, motor vehicle accidents, mood disorders (depression, anxiety), alcohol and other substance abuse, cardiovascular, respiratory, renal, gastrointestinal, musculoskeletal disorders, obesity, impaired immune system function and a reported increased risk of mortality.</b></p> <p><b>World Health Organization "Night Noise Guidelines for Europe" 2009</b></p> <p><b><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p>



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	<p>3.3.6 Other Adverse Health Effects of Sound</p> <p><i>The A/CanWEA Panel Review displays selective bias by attempting to understate the risk of noise induced chronic health problems such as hypertension and heart disease. The A/CanWEA Panel Review selectively quotes references, many of which are decades old to understate this risk.</i></p> <p><i>World Health Organization states:</i></p> <p><i>“Recent research clearly links exposure to night noise with harm to health. Noise can aggravate serious health problems, beyond damage to hearing, particularly through its effects on sleep and the relations between sleep and health. When people are asleep, their ears, brains and bodies continue to react to sounds. Sleep disturbance and annoyance are the first effects of night noise and can lead to mental disorders.</i></p> <p><i>The effects of noise can even trigger premature illness and death. Night noise from aircraft can increase blood pressure, even if it does not wake people.”</i></p> <p><i><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008_1">http://www.euro.who.int/mediacentre/PR/2009/20091008_1</a></i></p> <p><i>World Health Organization “Night Noise Guidelines for Europe” 2009 states</i></p> <p><i>“Above 55 dB The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.”</i></p> <p><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><i>The A/CanWEA Panel Review assumes people are inside their homes 24 hours a day with doors and windows shut. This is inaccurate.</i></p> <p><i>Families are entitled to work, play and enjoy all areas of their property. Infants, children, adults and seniors risk being exposed to wind turbine outdoor noise levels much higher than the guidelines allow for noise receptors (homes).</i></p>



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	<p><b>Modern wind turbines emit 100 to 110 dBA Sound Power Level. Unweighted Sound Power Levels which are seldom reported are 120 dB or higher. Additional turbines result in higher combined sound pressure levels. Typically noise guidelines for wind turbines provide no protection for humans outside of their home. In Ontario it is allowable for multiple wind turbines to be sited within 50 meters (blade length plus 10 meters) of a non participant's property line. As an example on a one hundred acre parcel of land it is possible for individuals to be exposed on their property to wind turbine sound pressure levels which may cause speech interference, task interference, annoyance and other adverse health effects of sound. (previously referenced above section 3.3)</b></p> <p><b>The A/CanWEA Panel Review ignores this environmental exposure and the associated risks to human health.</b></p> <p><b>In summary:</b></p> <p><b>Wind turbines emit industrial noise pollution. Wind turbine "noise is a primary siting constraint".</b></p> <p align="center"><b>Rogers, A. and J. Manwell . Wright, S. 2002. Wind turbine acoustic noise. Amended January 2006</b></p> <p align="center"><b>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</b></p> <p><b>The A/CanWEA Panel Review displays selective bias by understating the risk of adverse health effects from environmental noise.</b></p> <p><b>The A/CanWEA Panel Review displays selective bias by consistently ignoring the recommendations and guidance of the World Health Organization on the issue of noise and health. (see discussion regarding World Health Organization page 4-13)</b></p>
3-14	<p>"On the other hand, many people become accustomed to regular exposure to noise or other potential stressors, and are no longer annoyed."</p> <p><b>This A/CanWEA Panel Review statement is false.</b></p> <p><b>World Health Organization states</b></p> <p align="center"><b>"During sleep the auditory system remains fully functional.</b></p>



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	<p><i>Incoming sounds are processed and evaluated and although physiological changes continue to take place, sleep itself is protected because awakening is a relatively rare occurrence. Adaptation to a new noise or to a new sleeping environment (for instance in a sleep laboratory) is rapid, demonstrating this active protection. The physiological reactions do not adapt, as is shown by the heart rate reaction and the increase of average motility with sound level."</i></p> <p><i>World Health Organization "Night Noise Guidelines for Europe" 2009</i></p> <p><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p>
3-17	<p>3.4.3 Low-Frequency Sound and Infrasound</p> <p>"No scientific studies have specifically evaluated health effects from exposure to low frequency sound from wind turbines."</p> <p><i>The absence of scientific studies does not imply that health effects from exposure to low frequency sound from wind turbines do not occur - it implies scientific uncertainty and the requirement for third party independent health studies.</i></p> <p><i>There is no medical doubt that audible noise such as emitted by modern upwind industrial wind turbines sited close to human residences causes significant adverse health effects. These effects are mediated through sleep disturbance, physiological stress and psychological distress. This <u>is</u> settled medical science.</i></p> <p><i>Sound energy in the infra and low frequency range may also be a factor for other adverse health effects. Although these sounds may be sub-audible to all but the most sensitive people, others may perceive it as internal body sensations. This is compounded indoors, because the sound pressure levels inside homes may be augmented by building resonance and harmonics. This can result in a larger percentage of the general population that may perceive the sound or vibration in their body or home, and stronger effects on those who responded without such augmentation. It can also result in perceptible audible noise to people who may not have perceived the sounds outdoors or in another building with different resonance characteristics.</i></p>



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	<p><b><i>The extent to which infra and low frequency noise from wind turbines inside or outside homes causes direct adverse effects upon the human body remains an open question - there is <u>no</u> settled medical science on this issue as yet.</i></b></p> <p>"Natural sources of low frequency sound include wind, rivers, and waterfalls in both audible and non-audible frequencies. Other sources include road traffic, aircraft, and industrial machinery. The most common source of infrasound is vehicular (National Toxicology Program, 2001)."</p> <p><b><i>This statement is misleading. There are references that wind turbine low frequency noise is unique.</i></b></p> <p><b><i>Alberts, D. 2006. Primer for Addressing Wind Turbine Noise states:</i></b></p> <p><b><i>"Wind turbine noise, especially at lower wind and blade speeds, will contain more low frequency components than traffic noise."</i></b></p> <p><b><i>(Note: this reference is listed in Additional References but the citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b><i>Soysai, H., and O. Soysai. Wind farm noise and regulations in the eastern United States. 2007 states:</i></b></p> <p><b><i>"Sound generated by wind turbines has particular characteristics and it creates a different type of nuisance compared to usual urban, industrial, or commercial noise. The interaction of the blades with air turbulences around the towers creates low frequency and infrasound components, which modulate the broadband noise and create fluctuations of sound level. The lower frequency fluctuation of the noise is described as 'swishing' or 'whooshing' sound, creating an additional disturbance due to the periodic and rhythmic characteristic."</i></b></p> <p><b><i>(Note: this applies to the lower frequency fluctuation of sound of modern upwind industrial scale wind turbines. This reference is listed in Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b><i>"The U.S. Food and Drug Administration (FDA) has approved the use of infrasound for therapeutic massage at 70 dB in the 8 to 14 Hz range</i></b></p>



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	<p>(National Toxicology Program, 2001). In light of the FDA approval for this type of therapeutic use of infrasound, it is reasonable to conclude that exposure to infrasound in the 70 dB range is safe."</p> <p><b><i>This A/CanWEA Panel Review conclusion has no reference to support it.</i></b></p> <p><b><i>A therapeutic device would likely have operating instructions and guidance.</i></b></p> <p><b><i>The product website states:</i></b></p> <p align="center"><b><i>"...it should not be used within six inches of a pacemaker, and should not be used on the calves where blood clots are suspected."</i></b></p> <p align="center"><b><i>"Therapy on the developing fetus has not been studied, we do not recommend applying it directly over the developing fetus."</i></b></p> <p align="center"><b><i><a href="http://www.chinahealthways.com">http://www.chinahealthways.com</a></i></b></p>
3-15 3-16	<p>3.4.1 Evaluation of Annoyance and Dose-Response Relationship of Wind Turbine Sound</p> <p>"To date, three studies in Europe have specifically evaluated potential health effects of people living in proximity to wind turbines (Pedersen and Persson Waye, 2004; Pedersen and Persson Waye, 2007; Pedersen et al., 2009)."</p> <p><b><i>This A/CanWEA Panel Review statement is misleading as none of the three studies cited were specifically designed to "specifically" evaluate potential adverse health effects. The studies were very specific in scope as noted below:</i></b></p> <p><b><i>Project WINDFARMperception Visual and acoustic impact of wind turbine farms on residents Pedersen et al., 2008 states:</i></b></p> <p align="center"><b><i>"The purpose of this study is to gain insight into the perception of a modern wind farm by residents living nearby such a farm. The objective of the WINDFARMperception project is:</i></b></p> <ul style="list-style-type: none"> <li><b><i>- to provide knowledge on the perception of wind turbines by people living close to windfarms;</i></b></li> <li><b><i>- to evaluate human responses to audio and visual exposures from wind turbines and to give insight in possibilities to mitigate the local impact of wind farms."</i></b></li> </ul>



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	<p><b>Pedersen, E. and K. Persson Waye. 2007. Wind turbine noise, annoyance and self-reported health and wellbeing in different living environments states:</b></p> <p align="center"><b><i>“The objectives of this study were to evaluate the prevalence of perception and annoyance due to wind turbine noise among people living in the vicinity of one or more turbines, and to study relationships between noise and perception/annoyance with focus on differences between different living environments.”</i></b></p> <p><b>Perception and annoyance due to wind turbine noise—a dose-response relationship Eja Pedersen and Kerstin Persson Waye 2004 states</b></p> <p align="center"><b><i>“The aims of this study were to evaluate the prevalence of annoyance due to wind turbine noise and to study dose-response relationships. The intention was also to look at interrelationships between noise annoyance and sound characteristics, as well as the influence of subjective variables such as attitude and noise sensitivity.”</i></b></p> <p><b>The three studies cited documented high annoyance and sleep disturbance associated with wind turbines.</b></p> <p><b>The A/CanWEA Panel Review fails to note that:</b></p> <p><b>Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents Pedersen et al., 2008 concludes:</b></p> <p align="center"><b><i>“With respect to other health effects associated with wind turbines:</i></b></p> <ul style="list-style-type: none"> <li><b><i>• The risk for sleep interruption by noise was higher at levels of wind turbine sound above 45 dBA than at levels below 30 dBA.</i></b></li> <li><b><i>• Annoyance with wind turbine noise was associated with psychological distress, stress difficulties to fall asleep and sleep interruption.”</i></b></li> </ul> <p><b>The A/CanWEA Panel Review fails to note that:</b></p> <p><b>Perception and annoyance due to wind turbine noise—a dose-response relationship Eja Pedersen and Kerstin Persson Waye 2004 states:</b></p>



A/CanWEA Panel Review Page Reference	<p><b>Table 1</b></p> <p><b>Analysis</b></p> <p>A/CanWEA Panel Review contents in non bold quotations  <i>The Society for Wind Vigilance analysis in bold italicized</i></p>
	<p><i>"At lower sound categories, no respondents were disturbed in their sleep by wind turbine noise, but 16% (n520, 95%CI: 11%–20%) of the 128 respondents living at sound exposure above 35.0 dBA stated that they were disturbed in their sleep by wind turbine noise."</i></p> <p><i>"Some of the respondents also stated that they were disturbed in their sleep by wind turbine noise, and the proportions seemed to increase with higher SPL. The number of respondents disturbed in their sleep, however, was too small for meaningful statistical analysis, but the probability of sleep disturbances due to wind turbine noise can not be neglected at this stage."</i></p> <p><i>The A/CanWEA Panel Review ignores that:</i></p> <p><i>Regarding:</i></p> <p><i>Pedersen, E. and K. Persson Waye. 2007. Wind turbine noise, annoyance and self-reported health and wellbeing in different living environments:</i></p> <p><i>Table 1, contained in the report, indicates the mean SPL for respondents was 33.4 dBA which is far lower than the wind turbine SPL that many families are being subjected to.</i></p> <p><i>In an interview with A/CanWEA Panel Review author Dr. Robert McCunney states:</i></p> <p><i>"... the existing peer-reviewed literature generally examined exposure to sounds from homes or residential areas that are about one kilometre away or further from wind turbines."</i></p> <p><i>Canwest News Service December 16, 2009</i></p> <p><i>In North America many turbines have been sited less than 400 metres from homes. New set back guidelines in Ontario allow for multiple turbines within 550 meters of a home.</i></p> <p><i>The A/CanWEA Panel Review displays selective bias by omitting to discuss the significance of the typical setback distances and sound power levels in the references cited.</i></p> <p><i>The report found that:</i></p>



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	<p><b><i>"Annoyance was further associated with lowered sleep quality and negative emotions. This, together with reduced restoration possibilities may adversely affect health."</i></b></p> <p><b><i>The A/CanWEA Panel Review displays selective bias by omitting sleep disturbance, annoyance, stress, and negative emotions (adverse psychological effects) reported by the references used by the Panel.</i></b></p> <p><b><i>"Although some people may be affected by annoyance, there is no scientific evidence that noise at levels created by wind turbines could cause health problems"</i></b></p> <p><b><i>The A/CanWEA Panel Review displays selective bias by concluding with a citation from a 2003 reference when subsequent references by the same author, Eja Pedersen, state in 2004, 2007 and 2008:</i></b></p> <p><b><i>"Some of the respondents also stated that they were disturbed in their sleep by wind turbine noise, and the proportions seemed to increase with higher SPL. The number of respondents disturbed in their sleep, however, was too small for meaningful statistical analysis, but the probability of sleep disturbances due to wind turbine noise can not be neglected at this stage."</i></b></p> <p><b><i>Perception and annoyance due to wind turbine noise—a dose–response relationship Eja Pedersen and Kerstin Persson Waye 2004</i></b></p> <p><b><i>"Annoyance was further associated with lowered sleep quality and negative emotions. This, together with reduced restoration possibilities may adversely affect health."</i></b></p> <p><b><i>Pedersen, E. and K. Persson Waye. 2007. Wind turbine noise, annoyance and self-reported health and wellbeing in different living environments</i></b></p> <p><b><i>"With respect to other health effects associated with wind turbines:</i></b></p> <ul style="list-style-type: none"> <li><b><i>• The risk for sleep interruption by noise was higher at levels of wind turbine sound above 45 dBA than at levels below 30 dBA.</i></b></li> <li><b><i>• Annoyance with wind turbine noise was associated with psychological distress, stress difficulties to fall asleep and sleep interruption."</i></b></li> </ul>



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	<p align="center"><b><i>Project WINDFARMperception Visual and acoustic impact of wind turbine farms on residents Pedersen et al., 2008</i></b></p> <p><b><i>Project WINDFARMperception Visual and acoustic impact of wind turbine farms on residents Pedersen et al., 2008 concludes:</i></b></p> <p align="center"><b><i>"Perhaps the main finding is that wind turbine sound is relatively annoying, more so than equally loud sound from aircraft or road traffic. A swishing character is perceived by most respondents, indicating that this is an important characteristic of wind turbine sound. Sound should therefore receive more attention in the planning of wind farms, and (more) sound mitigation measures must be considered."</i></b></p> <p><b><i>The A/CanWEA Panel Review displays selective bias by omitting this citation which recommends "additional sound mitigation measures be considered." The A/CanWEA Panel Review ignores this recommendation in section 4.6.3 Wind Turbine Siting Guidelines (see discussion regarding pages 4-13 to 4-15)</i></b></p> <p><b><i>There are other relevant findings in these three studies cited which the A/CanWEA Panel Review neglected to discuss or reference.</i></b></p>
3-17	<p><b><i>"According to a report of the National Research Council (NRC), low frequency sound is a concern for older wind turbines but not the modern type (National Research Council, 2007)."</i></b></p> <p><b><i>This statement contained in the A/CanWEA Panel Review is misquoted.</i></b></p> <p><b><i>According to "Public Health Impacts of Wind Turbines" Prepared by: Minnesota Department of Health Environmental Health Division, 2009</i></b></p> <p align="center"><b><i>"The National Research Council of the National Academies (NRC, 2007) has reviewed impacts of wind energy projects on human health and well-being. The NRC begins by observing that wind projects, just as other projects, create benefits and burdens, and that concern about impacts is natural when the source is near one's home. Further, the NRC notes that different people have different values and levels of sensitivity. Impacts noted by the NRC that may have the most effect on health include noise and low frequency vibration, and shadow flicker."</i></b></p>



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	<p><b>Based on the draft copy of "National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects NRC, Washington, DC."</b></p> <p><b>This citation states:</b></p> <p><b><i>"Broadband, tonal, and low-frequency noise have all been addressed to some degree in modern upwind horizontal wind turbines, and turbine technologies continue to improve in this regard."</i></b></p> <p><b>The qualification that "Broadband, tonal, and low-frequency noise have all been addressed to some degree" suggests that there are still low-frequency noise issues with modern turbines. This qualification contradicts the A/CanWEA Panel Review statement.</b></p> <p><b>"According to a report of the National Research Council (NRC), low frequency sound is a concern for older wind turbines but not the modern type (National Research Council, 2007)."</b></p> <p><b>This is confirmed on page 4-1 of the A/CanWEA Panel Review where it is acknowledged that:</b></p> <p><b>"The low frequency sound emitted by spinning wind turbines could possibly be annoying to some..."</b></p> <p><b>The A/CanWEA Panel Review displays selective bias by omitting the following passages from the National Research Council draft cited:</b></p> <p><b><i>"Low-frequency vibration and its effects on humans are not well understood. Sensitivity to such vibration resulting from wind-turbine noise is highly variable among humans. Although there are opposing views on the subject, it has recently been stated (Pierpont 2006) that "some people feel disturbing amounts of vibration or pulsation from wind turbines, and can count in their bodies, especially their chests, the beats of the blades passing the towers, even when they can't hear or see them." More needs to be understood regarding the effects of low-frequency noise on humans."</i></b></p> <p><b><i>"Guidelines for measuring noise produced by wind turbines are provided in the standard, IEC 61400-11: Acoustic Noise Measurement Techniques for Wind Turbines (IEC 2002), which specifies the instrumentation, methods, and locations</i></b></p>



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	<p><i>for noise measurements. Wind-energy developers are required to meet local standards for acceptable sound levels; for example, in Germany, this level is 35 dB(A) for rural nighttime environments."</i></p> <p><i>"Noise-emission measurements potentially are subject to problems, however. A 1999 study involving noise-measurement laboratories from seven European countries found, in measuring noise emission from the same 500 kW wind turbine on a flat terrain, that while apparent sound power levels and wind speed dependence could be measured reasonably reliably, tonality measurements were much more variable (Kragh et al. 1999.) In addition, methods for assessing noise levels produced by wind turbines located in various terrains, such as mountainous regions, need further development."</i></p> <p><i>"Shadow flicker caused by wind turbines can be an annoyance, and its effects need to be considered during the design of a wind-energy project. In the United States, shadow flicker has not been identified as even a mild annoyance. In Northern Europe, because of the higher latitude and the lower angle of the sun, especially in winter, shadow flicker has, in some cases, been noted as a cause for concern."</i></p> <p><i>"Recent research studies regarding noise from wind-energy projects suggest that the industry standards (such as the IEC 61400-11 guidelines) for assessing and documenting noise levels emitted may not be adequate for nighttime conditions and projects in mountainous terrain. This work on understanding the effect of atmospheric stability conditions and on site-specific terrain conditions and their effects on noise needs to be accounted for in noise standards. In addition, studies on human sensitivity to very low frequencies are recommended. Computational tools have become available that not only compute shadow flicker in real time during turbine operation, but also convey information to the turbine-control system to allow shutdown if the shadow flicker at a particular location becomes particularly problematic. Hence, the development and implementation of a real-time system at a wind-energy project to take such actions when shadow flicker is indicated might be useful."</i></p>
4-1	4.1 Infrasound, Low-Frequency Sound, and Annoyance



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	<p>"The infrasound emitted from wind turbines is at a level of 50 to 70 dB, sometimes higher, but well below the audible threshold. There is a consensus among acoustic experts that the infrasound from wind turbines is of no consequence to health."</p> <p><b><i>The NASA Technical paper "Wind Turbine Acoustics" states:</i></b></p> <p><b><i>"People who are exposed to wind turbine noise inside buildings experience a much different acoustic environment than do those outside....They may actually be more disturbed by the noise inside their homes than the would be outside."</i></b></p> <p><b><i>The paper also states:</i></b></p> <p><b><i>"One of the common ways that a person might sense the noise-induced excitation of a house is through structural vibrations. This mode of observation is particularly significant at low frequencies, below the threshold of normal hearing."</i></b></p> <p>"The low frequency sound emitted by spinning wind turbines could possibly be annoying to some when winds are unusually turbulent, but there is no evidence that this level of sound could be harmful to health."</p> <p><b><i>Public Health Impacts of Wind Turbines</i></b>  <b><i>Prepared by: Minnesota Department of Health</i></b>  <b><i>Environmental Health Division states:</i></b></p> <p><b><i>"Wind turbines generate a broad spectrum of low-intensity noise. At typical setback distances higher frequencies are attenuated. In addition, walls and windows of homes attenuate high frequencies, but their effect on low frequencies is limited."</i></b></p> <p><b><i>"The most common complaint in various studies of wind turbine effects on people is annoyance or an impact on quality of life. Sleeplessness and headache are the most common health complaints and are highly correlated (but not perfectly correlated) with annoyance complaints. Complaints are more likely when turbines are visible or when shadow flicker occurs."</i></b></p> <p><b><i>"Most available evidence suggests that reported health effects are related to audible low frequency noise."</i></b></p>



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	<p><i>Complaints appear to rise with increasing outside noise levels above 35 dB(A)."</i></p> <p><b>Alberts, D. 2006. Primer for Addressing Wind Turbine Noise states:</b></p> <p><i>"For broadband noise, such as wind turbines produce, the low frequency components may travel further than the higher frequency components. Since low-frequency noise is particularly annoying to most people, it is important to specify limits for low frequency noise."</i></p> <p><i>"Wind turbine noise, especially at lower wind and blade speeds, will contain more low frequency components than traffic noise. Light weight building home structures will not attenuate these frequencies components as well as higher frequency components."</i></p> <p><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><b>Incorporating Low Frequency Noise Legislation for the Energy Industry in Alberta, Canada</b>  <b>Authors: DeGagne, David C.; Lapka, Stephanie D states:</b></p> <p><i>"Complaints related to LFN are often described by the affected party as a deep, heavy sound, like "humming," sometimes with an accompanying vibration. In some cases, the direction of the source of the LFN will be unknown to the receptor. However, it is the complainant that is most able to detect the presence of the LFN, signifying a particular sensitivity of the individual to the sound while others in the same family may not be able to detect the sound at all. To make a proper determination for the presence of LFN, the data must be collected during a time when environmental conditions are representative of when the sound is annoying. Residents who are impacted by LFN may suffer from sleep disturbances, headaches, and in some cases chronic fatigue."</i></p> <p><i>"Unlike higher frequency noise issues, LFN is very difficult to suppress. Closing doors and windows in an attempt to diminish the effects sometimes makes it worse because of the propagation characteristics and the low-pass filtering effect of structures. Individuals often become irrational and</i></p>



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	<p><i>anxious as attempts to control LFN fail, serving only to increase the individual's awareness of the noise, accelerating the above symptoms."</i></p> <p><b>World Health Organization, Guidelines for Community Noise, 1999 states</b></p> <p><i>"Health effects due to low-frequency components in noise are estimated to be more severe than for community noises in general"</i></p> <p><i>(Note this reference is listed in the References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p>"If so, city dwelling would be impossible due to the similar levels of ambient sound levels normally present in urban environments. Nevertheless, a small number of people find city sound levels stressful."</p> <p><b><i>This A/CanWEA Panel Review conclusion does not appear to be based on scientific evidence. The conclusion there are no adverse health effects from noise on the basis that people are able live in cities ignores the ample evidence that environmental noise is a risk to human health.</i></b></p> <p><b>World Health Organization states:</b></p> <p><i>"Just like air pollution and toxic chemicals, noise is an environmental hazard to health. While almost everyone is exposed to too much noise, it has traditionally been dismissed as an inevitable fact of urban life and has not been targeted and controlled as much as other risks," concludes Dr Rokho Kim of the WHO Regional Office for Europe, who managed the project to draw up the guidelines. "We hope that the new guidelines will create a culture of noise awareness, and prompt governments and local authorities to invest effort and money in protecting health from this growing hazard, particularly in cities."</i></p> <p><u><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008">http://www.euro.who.int/mediacentre/PR/2009/20091008</a></u> <b>1</b></p> <p><b><i>"Noise seriously harms human health and interferes with people's daily activities at school, at work, at home and during leisure time. Traffic noise alone is harming the health of almost every third European. One in five Europeans is regularly exposed to sound levels at night that could</i></b></p>



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	<p align="center"><b><i>significantly damage health."</i></b></p> <p align="center"><u><a href="http://www.euro.who.int/Noise">http://www.euro.who.int/Noise</a></u></p>
4-3	<p>"The main health effect of noise stress is disturbed sleep, which may lead to other consequences."</p> <p>"There is no evidence that sound at the levels from wind turbines as heard in residences will cause direct physiological effects. A small number of sensitive people, however, may be stressed by the sound and suffer sleep disturbances."</p> <p><b><i>These A/CanWEA Panel Review statements are paradoxical. The statements acknowledge sleep disturbance(s) and stress may occur from wind turbine exposure. The second statement concludes there is no evidence direct physiological effects occur.</i></b></p> <p><b><i>World Health Organization, Guidelines For Community Noise 1999 states:</i></b></p> <p align="center"><b><i>Uninterrupted sleep is a prerequisite for good physiological and mental functioning, and the primary effects of sleep disturbance are: difficulty in falling asleep; awakenings and alterations of sleep stages or depth; increased blood pressure, heart rate and finger pulse amplitude; vasoconstriction; changes in respiration; cardiac arrhythmia; and increased body movements.</i></b></p> <p align="center"><b><i>(Note this reference is listed in the References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b><i>World Health Organization "Night Noise Guidelines for Europe" 2009 states:</i></b></p> <p align="center"><b><i>"There is plenty of evidence that sleep is a biological necessity, and disturbed sleep is associated with a number of health problems."</i></b></p> <p align="center"><b><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b><i>According to World Health Organization "Night Noise Guidelines for Europe" 2009:</i></b></p> <p><b><i>Sleep documented health related consequences of sleep debt</i></b></p>



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	<p><i>include poor performance at work, fatigue, memory difficulties, concentration problems, motor vehicle accidents, mood disorders (depression, anxiety), alcohol and other substance abuse, cardiovascular, respiratory, renal, gastrointestinal, musculoskeletal disorders, obesity, impaired immune system function and a reported increased risk of mortality among others.</i></p> <p><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><i>The A/CanWEA Panel Review is silent on what scientific basis it came to the conclusion that only "A small number of sensitive people" may be "stressed by the sound and suffer sleep disturbances."</i></p> <p><i>The A/CanWEA Panel Review qualification that only a small number and only sensitive people will be adversely affected is not supported by any credible reference.</i></p>
4-3 to 4-5	<p>4.1.3 Other Aspects of Annoyance</p> <p>4.1.4 Nocebo Effect</p> <p>4.1.5 Somatoform Disorders</p> <p><i>These sections of the A/CanWEA Panel Review are disturbing.</i></p> <p><i>The A/CanWEA Panel Review acknowledges that wind turbine noise may cause annoyance, stress and sleep disturbance and that, as a result people may experience adverse physiological and psychological symptoms.</i></p> <p><i>One of the authors of the report W. David Colby, M.D. has stated:</i></p> <p><i>"We're not denying that there are people annoyed and that maybe some of them are getting stressed out enough about being annoyed that they're getting sick."</i></p> <p><i>Sounding Board, 97.9 FM The Beach December 17, 2009</i></p> <p><i>Despite these acknowledgements and without having studied victims the authors of the A/CanWEA Panel Review offer the Nocebo Effect and Somatoform Disorders as causal explanations for physiological and psychological symptoms being reported by clinicians such as Dr. Pierpont.</i></p> <p><i>Without having studied victims, the A/CanWEA Panel Review</i></p>



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	<p><b><i>speculates further that:</i></b></p> <p>"Associated stress from annoyance, exacerbated by the rhetoric, fears, and negative publicity generated by the wind turbine controversy, may contribute to the reported symptoms described by some people living near rural wind turbines."</p> <p><b><i>There are people reporting adverse health effects from exposure to wind turbines. Families including children have abandoned their homes to protect their health. This cannot be denied.</i></b></p> <p><b><i>There are European peer review studies that have documented high annoyance and sleep disturbance in populations exposed to industrial wind turbines.</i></b></p> <p><b><i>A 2009 court decision requires a France industrial wind turbine facility to shut down at night to protect the local population from sleep disturbance.</i></b></p> <p><b><i><a href="http://www.ouest-france.fr/actu/actuLocale_-La-justice-demande-l-arret-nocturne-des-huit-eoliennes-de-Cast_-1183050-----29103-abd_actu.Htm">http://www.ouest-france.fr/actu/actuLocale_-La-justice-demande-l-arret-nocturne-des-huit-eoliennes-de-Cast_-1183050-----29103-abd_actu.Htm</a></i></b></p> <p><b><i>Clinicians and other researchers have documented victim symptoms and sleep disturbance which tends to be reported as the number one health complaint.</i></b></p> <p><b><i>The A/CanWEA Panel Review ignores the literature on the effects of annoyance, stress and sleep disturbance and the associated symptoms.</i></b></p>
4-8 4-11	<p><b>4.3 Wind Turbine Syndrome</b></p> <p><b><i>The A/CanWEA Panel Review does not deny there are victims experiencing symptoms from exposure to industrial wind turbines.</i></b></p> <p>"The symptoms are common in cases of extreme and persistent annoyance, leading to stress responses in the affected individual and may also result from severe tinnitus, when there is no external sound."</p> <p><b><i>The A/CanWEA Panel Review concludes</i></b></p> <p>"The symptoms are exhibited by a small proportion of sensitive persons..."</p>



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	<b><i>A/CanWEA Panel Review does not provide a credible reference for this statement.</i></b>
4-13	<p>4.6 Standards for Siting Wind Turbines</p> <p>4.6.1 Introduction</p> <p>"Opponents of wind energy development argue that the height and setback regulations established in some jurisdictions are too lenient and that the noise limits which are applied to other sources of noise (either industrial or transportation) are not sufficient for wind turbines for a variety of reasons."</p> <p><b><i>The A/CanWEA Panel Review uses biased pre-emptive stereotyping by labelling individuals or groups who have legitimate concerns about the adverse effects from exposure to industrial wind turbines as "opponents". These pre-emptive stereotyping attempts to invalidate legitimate concerns at the onset.</i></b></p> <p><b><i>This pre-emptive stereotyping extends to concerned medical professionals such as members of the Maine Medical Association who have passed a resolution calling for independent research and the development of authoritative wind turbine guidelines designed to protect human health.</i></b></p> <p><b><i>This pre-emptive stereotyping dismisses the claim that the panel is independent and unbiased.</i></b></p> <p><b><i>Preliminary findings of a controlled study (Mars Hill, Maine) being conducted by Dr. Michael Nissenbaum to investigate potential negative health effects concludes that adults living within 1100 meters of industrial wind turbines suffer high incidences of chronic sleep disturbances and headaches, among other somatic complaints, and high incidences of dysphoric psychiatric symptomatology, compared to a control group living 5000-6000 meters away.</i></b></p> <p><b><i>Significantly, they require increased prescription medications to deal with these symptoms compared to the control group. Most symptomatology appears attributable to the quality and persistence of the noise generated by the turbine installations. Additional investigation of the children living in close proximity to industrial wind turbines is urgently needed. Improvements in pre-construction sound modeling and siting ordinances are required to prevent the negative health effects observed in our study population. This is a work in progress.</i></b></p>



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	<p align="center"><a href="http://windvigilance.com/mars_hill.aspx">http://windvigilance.com/mars_hill.aspx</a></p> <p><i>The A/CanWEA Panel Review displays selective bias by failing to acknowledge that wind turbine noise is unique in character.</i></p> <p><i>Alberts, D. 2006. Primer for Addressing Wind Turbine Noise states:</i></p> <p align="center"><i>"Wind turbine noise, especially at lower wind and blade speeds, will contain more low frequency components than traffic noise."</i></p> <p align="center"><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><i>Soysai, H., and O. Soysai. Wind farm noise and regulations in the eastern United States. 2007 states</i></p> <p align="center"><i>"Sound generated by wind turbines has particular characteristics and it creates a different type of nuisance compared to usual urban, industrial, or commercial noise. The interaction of the blades with air turbulences around the towers creates low frequency and infrasound components, which modulate the broadband noise and create fluctuations of sound level. The lower frequency fluctuation of the noise is described as 'swishing' or 'whooshing' sound, creating an additional disturbance due to the periodic and rhythmic characteristic."</i></p> <p align="center"><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></p> <p><i>Aero acoustics of large wind Turbines Harvey Hubbard Lockheed Engineering and Sciences Company, Kevin P Shepherd NASA</i></p> <p align="center"><i>"There is a concern for the possible adverse environmental impact of noise from large horizontal axis wind turbines operated for electric power generation. Widespread deployment of such machines is anticipated in wind power stations, some of which may be located in proximity to residential areas. Routine operations of such wind power stations may result in some unique community noise exposure situations."</i></p> <p><i>"Opponents of wind energy development argue that the height and</i></p>



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	<p>setback regulations established in some jurisdictions are too lenient and that the noise limits which are applied to other sources of noise (either industrial or transportation) are not sufficient for wind turbines for a variety of reasons."</p> <p><b><i>The A/CanWEA Panel Review displays selective bias with this statement.</i></b></p> <p><b><i>A European study concludes:</i></b></p> <p><b><i>"Perhaps the main finding is that wind turbine sound is relatively annoying, more so than equally loud sound from aircraft or road traffic. A swishing character is perceived by most respondents, indicating that this is an important characteristic of wind turbine sound. Sound should therefore receive more attention in the planning of wind farms, and (more) sound mitigation measures must be considered."</i></b></p> <p><b><i>Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents Pedersen et al., 2008</i></b></p> <p>"Consequently, there are those who advocate for a revision of the existing regulations for noise and setback pertaining to the siting of wind installations (Kamperman and James, 2009). Some have indicated their belief that setbacks of more than 1 mile may be necessary. While the primary purpose of this study was to evaluate the potential for adverse health effects rather than develop public policy, the panel does not find that setbacks of 1 mile are warranted."</p> <p><b><i>Note: the reference cited by the A/CanWEA Panel Review (Kamperman and James, 2009) should be dated (Kamperman and James, 2008).</i></b></p> <p><b><i>This A/CanWEA Panel Review statement is ambiguous. The impression is the A/CanWEA Panel Review favours set backs based on public policy over those designed to protect humans from adverse health effects.</i></b></p>
4-13 to 4-15	<p>4.6.3 Wind Turbine Siting Guidelines</p> <p><b><i>The A/CanWEA Panel Review does not deny there are victims experiencing adverse health effects from industrial wind turbines.</i></b></p> <p><b><i>One of the authors of the A/CanWEA Panel Review W. David Colby, M.D. reinforced this position regarding wind turbines by stating</i></b></p>



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	<p><b><i>"We're not denying that there are people annoyed and that maybe some of them are getting stressed out enough about being annoyed that they're getting sick."</i></b></p> <p><b><i>Sounding Board, 97.9 FM The Beach December 17, 2009</i></b></p> <p><b><i>The A/CanWEA Panel Review acknowledges that wind turbine noise can cause annoyance, stress and sleep disturbance.</i></b></p> <p><b><i>The A/CanWEA Panel Review acknowledges that these effects "may lead to other consequences".</i></b></p> <p><b><i>The A/CanWEA Panel Review acknowledges wind turbine low frequency noise can cause annoyance.</i></b></p> <p><b><i>Geoff Leventhall, one of the authors of the A/CanWEA Panel Review acknowledges the serious nature of low frequency noise induced annoyance by asserting:</i></b></p> <p><b><i>"The claim that their "lives have been ruined" by the noise is not an exaggeration..."</i></b></p> <p><b><i>Leventhall HG. Low frequency noise and annoyance. Noise Health 2004</i></b></p> <p><b><i>A European study concludes:</i></b></p> <p><b><i>"Perhaps the main finding is that wind turbine sound is relatively annoying, more so than equally loud sound from aircraft or road traffic. A swishing character is perceived by most respondents, indicating that this is an important characteristic of wind turbine sound. Sound should therefore receive more attention in the planning of wind farms, and (more) sound mitigation measures must be considered."</i></b></p> <p><b><i>Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents Pedersen et al., 2008</i></b></p> <p><b><i>Despite these acknowledgements, the A/CanWEA Panel Review neglects to advocate for authoritative regulations to mitigate the risk of adverse health effects.</i></b></p> <p><b><i>The A/CanWEA Panel Review discusses random noise limits based on policy, not health protection.</i></b></p>



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	<p><b><i>The A/CanWEA Panel Review uses a draft report titled "Environmental Noise and Health in the UK." to support that World Health Organization noise guidelines do not need to be followed:</i></b></p> <p>"Surveys have shown that about half of the UK population lives in areas where daytime sound levels exceed those recommended in the WHO Community Noise Guidelines. About two-thirds of the population live in areas where the night-time guidelines recommended by WHO are exceeded."</p> <p><b><i>This statement does not stand up to scrutiny under a preventative health care model.</i></b></p> <p><b><i>The A/CanWEA Panel Review ignores the serious nature of noise induced annoyance, stress and sleep disruption.</i></b></p> <p><b><i>The inclusion of this section displays selective bias: it favours noise intensive industries such as industrial wind energy. The A/CanWEA Panel Review does not state reasons for including this section. It is an attempt to encourage authorities to circumvent the World Health Organizations noise guidelines which are designed to protect human health.</i></b></p> <p><b><i>World Health Organization states</i></b></p> <p><b><i>"Just like air pollution and toxic chemicals, noise is an environmental hazard to health. While almost everyone is exposed to too much noise, it has traditionally been dismissed as an inevitable fact of urban life and has not been targeted and controlled as much as other risks," concludes Dr Rokho Kim of the WHO Regional Office for Europe, who managed the project to draw up the guidelines. "We hope that the new guidelines will create a culture of noise awareness, and prompt governments and local authorities to invest effort and money in protecting health from this growing hazard, particularly in cities."</i></b></p> <p><b><i><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008_1">http://www.euro.who.int/mediacentre/PR/2009/20091008_1</a></i></b></p> <p><b><i>"...one in five Europeans is regularly exposed to sound levels at night that could significantly damage their health."</i></b></p> <p><b><i><a href="http://www.euro.who.int/Noise/activities/20040721_1">http://www.euro.who.int/Noise/activities/20040721_1</a></i></b></p>
5-1	SECTION 5



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to 5-2	<p>Conclusions</p> <p>"There is nothing unique about the sounds and vibrations emitted by wind turbines."</p> <p><i>This conclusion contradicts the content of the A/CanWEA Panel Review which acknowledges that wind turbine noise is complex due to infrasound, low frequency noise, broadband noise, and amplitude modulation.</i></p> <p><i>The US Department of Energy states:</i></p> <p align="center"><i>"Types of Wind Turbine Sound Wind turbines make different types of sound, including broadband, infrasonic, impulsive, and tonal sound."</i></p> <p><i>Health Council of the Netherlands (HCN). 2004 The Influence of Night-time Noise on Sleep and Health. The Hague: Health Council of the Netherlands, 2004; publication no. 2004/14E."</i></p> <p><i>The HCN (2004) states:</i></p> <p><i>"The Committee has identified a number of forms of noise that may have a particularly pronounced effect on people exposed to them:</i></p> <ul style="list-style-type: none"> <li><i>• Noise characterised by low-pitch components (buzzing)</i></li> <li><i>• Noise consisting entirely of one or more low buzzing sounds (low-frequency noise)</i></li> <li><i>• Tonal noise</i></li> <li><i>• Noise events characterised by a rapid increase in intensity at the beginning (impulse noise)</i></li> <li><i>• Industrial noise</i></li> <li><i>• Noise characterised by sporadic high LAmax or SEL values."</i></li> </ul> <p><i>Wind turbine noise is known to contain most if not all of these forms of noise.</i></p> <p><i>Alberts, D. 2006. Primer for Addressing Wind Turbine Noise states:</i></p> <p align="center"><i>"Wind turbine noise, especially at lower wind and blade speeds, will contain more low frequency components than traffic noise."</i></p> <p><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the</i></p>



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	<p align="center"><i>A/CanWEA Panel Review)</i></p> <p><b>Soysai, H., and O. Soysai. Wind farm noise and regulations in the eastern United States. 2007 states:</b></p> <p><b><i>"Sound generated by wind turbines has particular characteristics and it creates a different type of nuisance compared to usual urban, industrial, or commercial noise. The interaction of the blades with air turbulences around the towers creates low frequency and infrasound components, which modulate the broadband noise and create fluctuations of sound level. The lower frequency fluctuation of the noise is described as 'swishing' or 'whooshing' sound, creating an additional disturbance due to the periodic and rhythmic characteristic."</i></b></p> <p><b><i>(Note this reference is listed in the Additional References but this citation was neglected in the main body of the A/CanWEA Panel Review)</i></b></p> <p><b>Aero acoustics of large wind Turbines Harvey Hubbard Lockheed Engineering and Sciences Company, Kevin P Shepherd NASA</b></p> <p><b><i>"There is a concern for the possible adverse environmental impact of noise from large horizontal axis wind turbines operated for electric power generation. Widespread deployment of such machines is anticipated in wind power stations, some of which may be located in proximity to residential areas. Routine operations of such wind power stations may result in some unique community noise exposure situations."</i></b></p>
5-2	<p><b>"In conclusion:</b></p> <p><b>1. Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans.</b></p> <p><b><i>Conclusion 1 contradicts the A/CanWEA Panel Review which acknowledges that wind turbine noise may cause annoyance, stress and sleep disturbance and that as a result people may experience adverse physiological and psychological symptoms.</i></b></p> <p><b>2. Subaudible, low frequency sound and infrasound from wind turbines do not present a risk to human health.</b></p> <p><b><i>Conclusion 2 contradicts the NASA Technical paper "Wind</i></b></p>



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	<p><b><i>Turbine Acoustics" which states:</i></b></p> <p><b><i>"People who are exposed to wind turbine noise inside buildings experience a much different acoustic environment than do those outside....They may actually be more disturbed by the noise inside their homes than the would be outside."</i></b></p> <p><b><i>The NASA Technical paper also states:</i></b></p> <p><b><i>"One of the common ways that a person might sense the noise-induced excitation of a house is though structural vibrations. This mode of observation is particularly significant at low frequencies, below the threshold of normal hearing."</i></b></p> <p><b><i>Conclusion 2 contradicts the A/CanWEA Panel Review statement from page 4-1 which states:</i></b></p> <p><b><i>"The low frequency sound emitted by spinning wind turbines could possibly be annoying to some..."</i></b></p> <p><b><i>The World Health Organization acknowledges annoyance as an adverse health effect.</i></b></p> <p><b><i>World Health Organization Guidelines For Community Noise 1999</i></b></p> <p><b><i>Conclusion 2 contradicts the A/CanWEA Panel Review statement from page 4-10 which states that physiological and psychological symptoms caused by annoyance include:</i></b></p> <p><b><i>"...distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension..."</i></b></p> <p><b><i>There is no medical doubt that audible noise such as emitted by modern upwind industrial wind turbines sited close to human residences causes significant adverse health effects. These effects are mediated through sleep disturbance, physiological stress and psychological distress. This is settled medical science.</i></b></p> <p><b><i>Sound energy in the infra and low frequency range may also be a factor for other adverse health effects. Although these sounds may</i></b></p>



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	<p><i>be sub-audible to all but the most sensitive people, others may perceive it as internal body sensations. This is compounded indoors, because the sound pressure levels inside homes may be augmented by building resonance and harmonics. This can result in a larger percentage of the general population that may perceive the sound or vibration in their body or home, and stronger effects on those who responded without such augmentation. It can also result in perceptible audible noise to people who may not have perceived the sounds outdoors or in another building with different resonance characteristics.</i></p> <p><i>The extent to which infra and low frequency noise from wind turbines inside or outside homes causes direct adverse effects upon the human body remains an open question - there is <u>no</u> settled medical science on this issue as yet.</i></p> <p>3. Some people may be annoyed at the presence of sound from wind turbines. Annoyance is not a pathological entity.</p> <p align="center"><b><i>Conclusion 3 contradicts World Health Organization which acknowledges annoyance is an adverse health effect.</i></b></p> <p align="center"><b><i>World Health Organization Guidelines For Community Noise 1999</i></b></p> <p align="center"><b><i>Conclusion 3 contradicts the A/CanWEA Panel Review statement from page 4-10 which states that physiological and psychological symptoms caused by annoyance include:</i></b></p> <p align="center"><i>"...distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension..."</i></p> <p>4. A major cause of concern about wind turbine sound is its fluctuating nature. Some may find this sound annoying, a reaction that depends primarily on personal characteristics as opposed to the intensity of the sound level."</p> <p align="center"><b><i>Conclusion 4 contradicts World Health Organization which acknowledges annoyance is an adverse health effect and states:</i></b></p> <p align="center"><b><i>"The annoyance response to noise is affected by several factors, including the equivalent sound pressure level and the highest sound pressure level</i></b></p>



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	<p><i>of the noise, the number of such events, and the time of day."</i></p> <p><i>World Health Organization Guidelines For Community Noise 1999</i></p> <p><i>Conclusion 4 contradicts The A/CanWEA Panel Review statement from page 3-13 which states that noise levels directly impact annoyance</i></p> <p><i>"Noise from airports, road traffic, and other sources (including wind turbines) may annoy some people, and, as described in Section 4.1, the louder the noise, the more people may become annoyed."</i></p> <p><i>Throughout the A/CanWEA Panel Review it is acknowledged that the wind turbine noise may cause annoyance, stress and sleep disturbance.</i></p> <p><i>The A/CanWEA Panel Review does not deny there are victims experiencing adverse health effects from exposure to industrial wind turbines.</i></p> <p><i>One of the authors of the report W. David Colby, M.D. has stated:</i></p> <p><i>"We're not denying that there are people annoyed and that maybe some of them are getting stressed out enough about being annoyed that they're getting sick."</i></p> <p><i>Sounding Board, 97.9 FM The Beach December 17, 2009</i></p> <p><i>World Health Organization states:</i></p> <p><i>"Sleep disturbance and annoyance are the first effects of night noise and can lead to mental disorders.</i></p> <p><i>The effects of noise can even trigger premature illness and death."</i></p> <p><i><a href="http://www.euro.who.int/mediacentre/PR/2009/20091008_1">http://www.euro.who.int/mediacentre/PR/2009/20091008_1</a></i></p>
	<p><b><u>The Society for Wind Vigilance Conclusion:</u></b></p>



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	<p><i>It is apparent from this analysis that the A/CanWEA Panel Review is neither authoritative nor convincing. The work is characterized by commission of unsupportable statements and the confirmation bias in the use of references. Many important references have been omitted and not considered in the discussion. Furthermore the authors have taken the position that the World Health Organization standards regarding community noise are irrelevant to their deliberation - a remarkable presumption.</i></p> <p><i>There is no medical doubt that audible noise such as emitted by modern upwind industrial wind turbines sited close to human residences causes significant adverse health effects. These effects are mediated through sleep disturbance, physiological stress and psychological distress. This is settled medical science.</i></p> <p><i>There are many peer-reviewed studies showing that infra and low frequency sound can cause adverse health effects, especially when dynamically modulated. Modern upwind industrial scale turbines of the types now being located in rural areas of North America require study. The extent to which infra and low frequency noise from wind turbines inside or outside homes causes direct adverse effects upon the human body remains an open question - there is no settled medical science on this issue as of yet.</i></p> <p><i>Perhaps the most egregious conclusion is that no more research is required. That statement implies that the science is settled which quite simply is false. It also demonstrates a disdain for the scientific method itself.</i></p> <p><i>There is but one conclusion: independent third party studies must be undertaken to establish the incidence and prevalence of adverse health effects relating to wind turbines. Beyond that a deeper understanding of the potential mechanisms for the impacts must be elucidated in order to define the mechanisms by which the sleep disturbance, stress and psychological distress occur.</i></p> <p><i>In contrast to the statement of the A/CanWEA Panel Review, our view is that a great deal of research is required for the protection of people's health.</i></p>
6-1 6-9	<p>SECTION 6 References</p> <p><i>The A/CanWEA Panel Review displays selective bias favouring the positions of CanWEA and AWEA by omitting relevant references.</i></p>



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	<p><i>Examples of obvious omissions of the A/CanWEA Panel Review include the research conducted by Dr Amanda Harry (UK) or Dr Michael A. Nissenbaum (USA). Both are available on the web.</i></p> <p><i>The A/CanWEA Panel Review ignores that members of the Maine Medical Association passed a Resolution RE: Wind Energy and Public Health”:</i></p> <p align="center"><i>“work with health organizations and regulatory agencies to provide scientific information of known medical consequences of wind development in order to help safeguard human health and the environment; and to ‘work with other stakeholders to encourage performance of studies on health effects of wind turbine generation by independent qualified researchers at qualified research institutions;”</i></p> <p align="center"><i>and to</i></p> <p align="center"><i>“ensure that physicians and patients alike are informed of evidence-based research results.”</i></p> <p><i>Preliminary findings of a controlled study (Mars Hill, Maine) being conducted by Dr. Michael Nissenbaum to investigate potential negative health effects concludes that adults living within 1100 meters of industrial wind turbines suffer high incidences of chronic sleep disturbances and headaches, among other somatic complaints, and high incidences of dysphoric psychiatric symptomatology, compared to a control group living 5000-6000 meters away.</i></p> <p><i>Significantly, they require increased prescription medications to deal with these symptoms compared to the control group. Most symptomatology appears attributable to the quality and persistence of the noise generated by the turbine installations. Additional investigation of the children living in close proximity to industrial wind turbines is urgently needed. Improvements in pre-construction sound modeling and siting ordinances are required to prevent the negative health effects observed in our study population. This is a work in progress.</i></p> <p align="center"><a href="http://windvigilance.com/mars_hill.aspx">http://windvigilance.com/mars_hill.aspx</a></p> <p><i>Other important references ignored by the A/CanWEA Panel Review include but are not limited to:</i></p>



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	<ul style="list-style-type: none"> <li>• <i>"Minnesota Department of Health (MDH) 2009 Public Health Impacts of Wind Turbines"</i></li> <li>• <i>"The Noise Association. 2006. Location, location, location. An investigation into wind farms and noise by The Noise Association"</i></li> <li>• <i>Noise Radiation From Wind Turbines Installed Near Homes: Effects On Health With an annotated review of the research and related issues by Barbara J Frey, BA, MA and Peter J Hadden, BSc, FRICS</i></li> <li>• <i>"Sleep Disturbance And Wind Turbine Noise" Dr Christopher Hanning BSc, MB, BS, MRCS, LRCP, FRCA, MD dated June 2009.</i></li> </ul>
6-8	<p>Alberts, D. 2006. Primer for Addressing Wind Turbine Noise.</p> <p><i>The A/CanWEA Panel Review displays selective bias by neglecting to include this reference in the body of the report.</i></p> <p><i>Relevant citations not cited in the A/CanWEA Panel Review include:</i></p> <p><i>The acknowledgment of the risk of sleep disturbance being a health risk.</i></p> <p><i>"a Dutch study that showed noise from a 30 MW wind farm becomes more noticeable and annoying to nearby residents at night. This study noted that although the noise is always present, certain aspects of turbine noise, such as thumping and swishing, were not noticeable during the day, but became very noticeable at night. Residents as far as 1900 meters from the wind farm complained about the night time noise."</i></p> <p><i>"For broadband noise, such as wind turbines produce, the low frequency components may travel further than the higher frequency components. Since low-frequency noise is particularly annoying to most people, it is important to specify limits for low frequency noise."</i></p> <p><i>"Wind direction also has an influence on sound propagation. Within 900 ft of a sound source, the wind</i></p>



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	<p><i>direction does not seem to influence the sound. After about 900 ft., the wind direction becomes a major factor in sound propagation. Downwind (meaning the wind is moving from the noise source towards the receiver) of the source, sound volume will increase for a time before decreasing.</i></p> <p><i>"Wind turbine noise, especially at lower wind and blade speeds, will contain more low frequency components than traffic noise. Light weight building home structures will not attenuate these frequencies components as well as higher frequency components."</i></p>
6-8	<p>Chatham-Kent Public Health Unit. 2008. The Health Impact of Wind Turbines: a Review of the Current White, Grey and Published Literature 2008.</p> <p><b>Regarding this reference Dr Colby stated:</b></p> <p><b><i>"The research and writing was done by April Rietdyk but I endorse and take full responsibility for the content."</i></b></p> <p><b>An October 2009 letter from The College of Physicians and Surgeons of Ontario, Inquiries, Complaints and Reports Committees Decisions and Reasons states that:</b></p> <p><b><i>"...the Committee observes, Dr. Colby's expertise is in medical microbiology and infectious diseases, an area quite distinct from audiology or other fields to the physical impact of wind turbines on human health. Thus the committee wishes to remind Dr. Colby, going forward, of the importance of fully disclosing the extent of his qualifications in a field that he has been retained as an "expert" and also to ensure he fully disclose to the public the organization or corporation by whom he has been retained by an expert."</i></b></p> <p><b>In addition:</b></p> <p><b><i>SkyPower, a wind energy developer advertised Dr Colby as one of their "representatives". Dr Colby has stated that he received an honorarium for this service.</i></b></p> <p><b><i>This document is an inadequate public health document. This statement is based on the following:</i></b></p> <p><b><i>The report displays selective bias favouring the wind energy industry in the presentation of the material referenced.</i></b></p> <ul style="list-style-type: none"> <li><b><i>• Heavy reliance on references from the wind energy industry</i></b></li> </ul>



A/CanWEA Panel Review Page Reference	<p align="center"><b>Table 1</b> <b>Analysis</b></p> <p align="center">A/CanWEA Panel Review contents in non bold quotations <i>The Society for Wind Vigilance analysis in bold italicized</i></p>
	<p>(CanWEA, AWEA, BWEA, Danish Wind Energy Association)</p> <ul style="list-style-type: none"> <li>• <i>Heavy reliance on references from listed members of CanWEA (Howe Gastmeier Chapnik Limited. Mississauga HGC Engineering)</i></li> <li>• <i>The report displays selective bias favouring the wind energy industry by the omission of relevant references.</i></li> <li>• <i>As a result of the above deficiencies the report provides incomplete risk assessments related to health including the failure to adequately consider the health impacts of annoyance, stress or sleep disturbance. (based on a key word searches of "annoyance", "stress" and "sleep disturbance")</i></li> <li>• <i>The report uses pre-emptive stereotyping of individuals who have concerns about associated with wind turbine facilities. (ie "Those Opposed to Wind Power").</i></li> </ul>
6-8	<p>Copes, R. and K. Rideout. Wind Turbines and Health: A Review of Evidence. Ontario Agency for Health Protection and Promotion 2009</p> <p><i>The power point slides contain few references and much of the material is similar to that used by the wind energy industry.</i></p> <p><i>The conclusion of the power point presentation is inconsistent as it states:</i></p> <p align="center"><i>"No evidence of noise-induced health effects at levels emitted by wind turbines"</i></p> <p><i>Then paradoxically concludes:</i></p> <p align="center"><i>" Stress and sleep disturbance possible"</i></p> <p align="center"><i>"Sound, flicker, aesthetics may affect annoyance + stress"</i></p> <p align="center"><i>"Health concerns are valid and must be addressed."</i></p> <p align="center"><i>"Any effects on health more likely related to annoyance/sleep disturbance than to direct effect of SPLs at residence."</i></p>
6-8	<p>Draft New Zealand standard for wind turbine sound.</p> <p><i>The A/CanWEA Panel Review displays selective bias by neglecting to include this reference in the body of the report.</i></p> <p><i>Relevant citations not cited in the A/CanWEA Panel Review</i></p>



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	<p><i>include:</i></p> <p><i>"Limits for wind farm noise are required to provide protection against sleep disturbance and maintain reasonable residential amenity."</i></p> <p><i>"In certain situations (see 5.3), consideration of a noise limit more stringent than 40 dB may be appropriate to further protect amenity for particular noise sensitive locations."</i></p> <p><i>As a result the draft standard recommends a secondary noise limit for quiet areas</i></p> <p><i>"Where a secondary noise limit is applicable, wind farm sound levels (LA90(10 min)) should not exceed the background sound level by more than 5 dB, or a level of 35 dB LA90(10 min), whichever is the greater."</i></p> <p><i>The New Zealand draft standard recommends improvement to sound modelling including testing being conducted at various temperature and atmospheric conditions.</i></p>
6-8	<p>2009. Maine Osteopathic Association Resolution: Wind Energy and Public Health.</p> <p><i>The Maine Osteopathic Association Resolution: Wind Energy and Public Health dated September 25, 2009 and is listed under Additional References of the A/CanWEA Panel Review.</i></p> <p><i>The Maine Medical Association Resolution: Wind Energy and Public Health. September 12, 2009 is not listed in the A/CanWEA Panel Review.</i></p> <p><i>The A/CanWEA Panel Review displays selective bias by including the Maine Osteopathic Association Resolution but neglecting to include the Maine Medical Association Resolution: Wind Energy and Public Health.</i></p>
6-8	<p>Keith, S. E., D. S. Michaud, and S. H. P. Bly. 2008. A proposal for evaluating the potential health effects of wind turbine noise for projects under the Canadian Environmental Assessment Act. Journal of Low Frequency Noise, Vibration and Active Control, 27 (4):253-265.</p> <p><i>This article acknowledges both annoyance and sleep disturbance may occur from wind turbines noise even at levels of 40dBA or 45dBA.</i></p>



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6-9	<p>Ramakrishnan, R. 2007. Acoustic Consulting Report Prepared for the Ontario Ministry of the Environment: Wind Turbine Facilities Noise Issues. Aiolos Engineering Corporation.</p> <p><i>In an email exchange Dr Ramani Ramakrishnan, the author of this reference states</i></p> <p><i>"I am not a medical doctor or a psychoacoustician or a physiological acoustician. I am an acoustician from the engineering science perspective. So, to comment on health issues is outside my area of expertise."</i></p> <p><i>This reference does however suggest scientific uncertainty by concluding</i></p> <p><i>"...additional concerns still need to be addressed in the next round of revisions to their assessment process. These revisions may need to be addressed after the results from future research provide scientifically consistent data for effects such as meteorology, human response and turbine noise source character."</i></p>
6-9	<p>Rogers, A. and J. Manwell . Wright, S. 2002. Wind turbine acoustic noise.</p> <p><i>The A/CanWEA Panel Review displays selective bias by neglecting to include this reference in the body of the report.</i></p> <p><i>From Rogers, A. and J. Manwell . Wright, S. 2002. Wind turbine acoustic noise. Amended January 2006</i></p> <p><i>It concludes:</i></p> <p><i>"...noise is a primary siting constraint."</i></p> <p><i>"Community noise standards are important to ensure liveable communities. Wind turbines must be held to comply with these regulations."</i></p>
6-9	<p>Soysai, H., and O. Soysai. Wind farm noise and regulations in the eastern United States. 2007.</p> <p><i>The A/CanWEA Panel Review displays selective bias by neglecting to include this reference in the body of the report.</i></p> <p><i>Relevant citations not cited in the A/CanWEA Panel Review</i></p>



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	<p><i>include:</i></p> <p><i>“Sound generated by wind turbines has particular characteristics and it creates a different type of nuisance compared to usual urban, industrial, or commercial noise. The interaction of the blades with air turbulences around the towers creates low frequency and infrasound components, which modulate the broadband noise and create fluctuations of sound level. The lower frequency fluctuation of the noise is described as ‘swishing’ or ‘whooshing’ sound, creating an additional disturbance due to the periodic and rhythmic characteristic.”</i></p> <p><i>“Specific noise limits need to be developed by considering the characteristics of wind turbine noise. Especially the low frequency sound components and the modulation of the background noise resulting must be considered to represent the activity interference of the wind turbine sound. Adequate criteria to asses the wind turbine sound will greatly help the development the wind industry by reducing the community reaction based on subjective opinions.”</i></p>
6-9	<p>World Health Organization (WHO). 2009. Night Noise Guidelines for Europe. The World Health Organization, Geneva, Switzerland.</p> <p><i>The A/CanWEA Panel Review displays selective bias by neglecting to include this reference in the body of the report.</i></p> <p><i>The A/CanWEA Panel Review acknowledges that wind turbines may cause sleep disturbance.</i></p> <p><i>In 2009 World Health Organization released Night Noise Guidelines for Europe which is a 184 page peer reviewed summary of the risks to human health that may result from noise induced sleep disturbance. Some of the adverse health documented include poor performance at work, fatigue, memory difficulties, concentration problems, motor vehicle accidents, mood disorders (depression, anxiety), alcohol and other substance abuse, cardiovascular, respiratory, renal, gastrointestinal, musculoskeletal disorders, obesity, impaired immune system function and a reported increased risk of mortality.</i></p> <p><i>The A/CanWEA Panel Review's failure to include an analysis of this document in the context of wind turbine noise induced sleep disturbance is a conspicuous omission.</i></p>



**END OF ANALYSIS**